

CLAIMS

1. Device for the quantified determination of the quality of surfaces having:
 - a first optical means comprising at least one illuminating means, its light directed at a predetermined angle to a measurement surface which is a part of the surface to be measured, as well as
 - a second optical means which is directed at a predetermined angle to the measurement surface and which receives the light reflected from said measurement surface, whereby said second optical means comprises at least one photosensor which emits an electrical measurement signal which is characteristic of said reflected light;
 - a control and evaluation means provided for controlling the measurement sequence and evaluating the measurement results and which comprises at least one processor and at least one memory means;
 - an output means;

wherein said illuminating means comprises at least one light source which is a light-emitting diode (LED),

whereby light emitted by said illuminating means is configured such that its spectral characteristic preferably comprises at least the blue, green and red spectral components of the visible spectrum, and

whereby a filter means is provided which is arranged in the path of radiation between said light source and said photosensor, and

wherein said evaluation means evaluates said reflected light and derives therefrom at least one parameter which characterizes said surface.

2. Device according to claim 1, characterized in that
at least one of said at least one parameter is the color of said measurement surface.
3. Device according to claim 1, characterized in that
at least one of said at least one characteristic parameter is taken from among a group of parameters which includes gloss, haze, fluorescence, distinctness of image (DOI), a representative measure of the typical wavelength and the amplitude of same (orange peel) of the surface topology of said measurement surface at a predetermined wavelength interval, whereby for the determining of said representative measure, an evaluation may also transpire at two or more wavelength bands, and a color of said measurement surface.
4. Device according to claim 3, characterized in that
two, three or more characteristic parameters of said measurement surface are determined.
5. Device according to claim 1, characterized in that
at least one of said at least one parameter comprises two, three or more characteristic values.
6. Device according to claim 1, characterized in that
at least one of said at least one parameter comprises a plurality of characteristic values which characterize the reflectivity of said measurement surface, whereby preferably essentially each of said characteristic values is characteristic of a spectral reflectivity at one wavelength band each.

7. Device according to claim 1, characterized in that
said illuminating means comprises a plurality of light sources, wherein
each of said light sources is a type of light source which is taken from
among a group of light sources which includes light-emitting diodes,
thermal light sources such as normal and halogen bulbs or such as
mercury, deuterium or xenon light sources, etc.
8. Device according to claim 1, characterized in that
said illuminating means comprises at least two light sources which differ in
their spectral emissions.
9. Device according to claim 8, characterized in that
said light sources of said illuminating means exhibit spectral
characteristics such that radiation is emitted essentially uninterruptedly
across essentially the entire visible spectrum
10. Device according to claim 7, characterized in that
said light sources of said plurality of light sources of said illuminating
means are rendered as light emitting diodes.
11. Device according to claim 1, characterized in that
said illuminating means comprises at least one thermal light source which
is preferably rendered as a halogen light source.
12. Device according to claim 1, characterized in that
said control means controls the measurement sequence such that at least
one fluorescence parameter is determined for the measurement surface.

13. Device according to claim 7, characterized in that said first optical means is controlled such that said light sources emit radiation essentially simultaneously which corresponds essentially to a predetermined spectral distribution.
14. Device according to claim 8, characterized in that said first optical means is controlled such that each spectrally differing light source of said first optical means emits radiation successively.
15. Device according to claim 8, characterized in that said control means controls said first and said second optical means such that a first measurement is conducted in which at least two light sources emit radiation simultaneously and that a second measurement is conducted in which at least two spectrally differing light sources emit radiation essentially successively.
16. Device according to claim 8, characterized in that said control means controls said measurement sequence such that one measurement is performed in which spectrally differing light sources emit radiation successively and the measurement results are filed in said memory means, and that said at least one fluorescence parameter is derived from said measurement results.
17. Device according to claim 1, characterized in that a plurality of photosensors is provided, arranged adjacent to one another.
18. Device according to claim 1, characterized in that a CCD chip is disposed as said photosensor, on which the photosensitive elements are arranged in a row or in rows and columns.

19. Device according to claim 1, characterized in that
a spectral means is arranged in the path of radiation between said illuminating means and said photosensor which splits the incident radiation subject to wavelength.
20. Device according to claim 19, characterized in that
said spectral means comprises at least one spectral splitting element which is taken from among a group of spectral splitting elements which includes absorbing, bending and refracting optical elements, phase and amplitude grids, surface and volume grids, transmission and reflection grids, holographic optical elements, color filters, color filter wedges, prisms and the like.
21. Device according to claims 18, characterized in that
said spectral means spectrally splits the incident light such that different wavelength bands of said incident light are deflected to different areas of said CCD array such that different photosensitive elements receive different wavelength bands.
22. Device according to claim 1, characterized in that
said filter means changes the spectral characteristic of the incident light in accordance with predetermined filter properties such that the spectral characteristic coincides substantially with a predetermined spectral distribution.
23. Device according to claim 22, characterized in that
said predetermined spectral distribution is a standard distribution which comprises a type of light taken from among a group of light standards which includes the C light type standard, the D65 light type standard, the A light type standard and other such similar standards.

24. Device according to claim 22, characterized in that said predetermined spectral distribution exhibits an essentially linear progression of intensity across the wavelengths in the visual range of the spectrum.
25. Device according to claim 1, characterized in that a spectral measurement characteristic, which is a product of the spectral characteristic of the light radiated onto said measurement surface and the spectral sensitivity of the sensor and the filter employed, is essentially proportional to the product of a spectral distribution of a light type standard and the visual sensitivity of the human eye.
26. Device according to claim 1, characterized in that a spectral measurement characteristic, which is a product of the spectral characteristic of the light radiated onto said measurement surface and the spectral sensitivity of the second optical means, yields a predetermined spectral progression upon a specific sampling.
27. Device according to claim 1, characterized in that said filter means comprises at least one or several filter elements which have predetermined spectral properties so that the light emitted from said illuminating means can be selectively influenced spectrally.
28. Device according to claim 27, characterized in that said filter means is configured such that the spectral properties of at least one filter element are controllable.
29. Device according to claim 7, characterized in that at least one intensity of one light source is controllable.

30. Device according to claim 1, characterized in that said spectral distribution of the light emitted by said illuminating means is controllable.
31. Device according to claim 1, characterized in that a diffusor means and an aperture means are disposed in said first optical means, whereby said diffusor means is configured so as to achieve a homogeneous illuminating of the measurement surface.
32. Device according to claim 1, characterized in that said evaluation means evaluates said measurement signals by means of a program stored in said memory means and/or stores same in said memory means.
33. Device according to claim 1, characterized in that the light emitted by said first optical means is directed to the surface at such an angle such that the light reflected directly from the measurement surface in accordance with the Fresnel reflection is at another angle with respect to the measurement surface than the angle between said measurement surface and the light reflected from said measurement surface as received by said second optical means.
34. Device according to claim 1, characterized in that at least one photosensor comprises at least two, preferably three or more photosensitive elements, the electrical output signals of which can be acquired individually and which differ in their spectral characteristic such that the color of the reflected light is ascertainable as an optical parameter of said measurement surface.

35. Device according to claim 1, characterized in that at least one temperature measuring means is arranged in as immediate proximity as possible to at least one light source and/or at least one photosensor, provided for the determining of the characteristic temperature of each respective light source and/or each respective photosensor so as to enable a temperature-corrected determination of said at least one parameter.
36. Method for determining the quantified quality of surfaces when employing a device in accordance with claim 1,
- in which the device is aligned relative a measurement surface; and
- a first optical means having at least one illuminating means radiates light at a predetermined angle to a measurement surface; and
- a portion of the light reflected from said measurement surface is received by one of a second optical means which is directed at a predetermined angle to said measurement surface, wherein a photosensor of said second optical means emits an electrical measurement signal which is characteristic of said reflected light; and
- a control and evaluation means controls the measurement sequence and evaluates the measurement results and derives therefrom at least one parameter which characterizes said surface; and
- an output means outputs said measurement results.

37. Device according to claim 19 characterized in that said spectral means spectrally splits the incident light such that different wavelength bands of said incident light are deflected to different areas of said CCD array such that different photosensitive elements receive different wavelength bands.